THE AMERICAN GAS LIGHT JOURNAL

VOL. CIV., No. 14. NEW YORK, APRIL 3, 1916. WHOLE No. 3,030.

Compulsory Health Insurance.

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The recent effort to force compulsory health insurance upon the wage-earners of the country has brought that important question before the people in several States within the last few weeks. Uniform bills have been introduced in the eleven legislatures in session this year, and the advocates of the system are especially active in the two great industrial States, New York and Massachusetts.

This proposed legislation—offered as a cure-all for helpless poverty—is pressed without regard to the opposition to precipitate action by organized labor, the only channel through which the wage-earner's voice can be heard, and without adequate investigation of what is being done by voluntary agencies at the present time. There are grave doubts as to the actuarial soundness of the plan so insistently recommended, since the opinion of insurance experts is that the assessments provided for, will in no wise cover the stipulated benefits.

The propagandists of the social insurance movement have been quick to seize upon the popular but superficial illustration of Germany's great efficiency, as evidenced in the present war. The health and strength of that nation and its ability to stand so long an endurance test have given the advocates of such legislation an opportunity to credit the general power of its military system to its social institutions, including, of course, health insurance.

Other contributing factors, such as the general sturdiness of the race, good habits, plain, simple, wholesome living, etc., are not taken into consideration, any more than the years of preparation and systematization by the general government.

It should be something of a shock to those interested to learn that the self-styled "first advocate" of social insurance in this country, I. M. Rubinow, in an article entitled "A Socialist Remedy for Unemployment," ("New Review," Nov. 15, 1915), states:

"Twelve years ago, when I began to preach social insurance, I was a man with a new idea in this country. * * * After all, social ills, like bodily ills, have only one true remedy, though it is not always known in time, and if we Socialists are at all right, these remedies must be in line with our philosophy."

Notwithstanding the objections to the compulsory health insurance plan, it cannot be denied that there is social system needed in the United States something that, in addition to providing for increased sanitary measures and housing accommodations to promote health, would encourage better insurance against misfortune among wage-earners. That this is true particularly in relation to health insurance is shown by the statistics of corporation voluntary relief associations. For instance, the statistics of the benefit association of one of our most humanitarian industrial enterprises show that in seven years there has been paid on claims $727,697.90, as against $144,721.96 for accidents. Inasmuch as the organization includes all types of employees in different parts of the country, it is safe to assume that the situation fairly typifies conditions of the wage-earning population in general.

It is granted then that some form or forms of health insurance is to be desired, if not an imperative need; but the important factor is the method to bring the greatest relief to the beneficiaries.

Leaders in the labor movement believe that the American workingman should be left to choose his method of insurance—through the trade union fund, the fraternal order, the industrial insurance company or the employer's relief department.

Mr. Hugh Frayne, an organizer of the American Federation of Labor, in a public address, said:

"I realize that this is one of the big problems confronting the people of this country. I understand that the sympathies of a great many people might be won over by the support of a movement to establish either State of federal control in the way of social insurance.

"The dangers have been pointed out to you by Mr. J. W. Sullivan, of the Typographical Union, and Mr. George W. Perkins, President of the International Cigar Makers' Union, the latter stating, 'We are opposed to having any of our economic activities chained to the police power of the State.'

"We shall oppose the enactment of any law to establish social insurance, either State or Federal, unless the same has first received the approval and endorsement of the American Federation of Labor.

"We are fighting not only for our members, we are fighting the battle of humanity, that there may be a better day, a better time for the men and women and the children of this country, that they may enjoy better things than they do now, so that some day we may wipe out poverty and charity, and, by the establishment of living standards through our unions, we will have made it possible for the man who has worked out his natural period in life to sit down by his fireside, content that in his early life he has worked for himself, for his fellow-man and for society; to establish himself in such a condition that it is unnecessary to ask charity from any source, to depend upon what has been accumulated by his own effort and co-operation with his fellow-man; and instead of asking charity, he will be, in ripe old age, able to extend advice, help and charity to those who need it."

The argument that only the provident insure, may in general be well taken, but that is not justification for abolishing individual initiative or for bringing to our country a foreign system of doubtful benefit. England and Germany are quoted in this connection as though the problem had been completely solved in those countries and no additional problems created. And yet the American advocates of compulsory health insurance legislation, prone to recognize as authorities on other subjects Mr. and Mrs. Sidney Webb, utterly ignore their strongly critical report on the operation of the English act in "The New Statesman."

This criticism says that the country was fitted with a scheme embracing, with dramatic suddenness, "*a vast multitude who were already providing what was requisite for themselves.* This enormous stretch of Governmental responsibility over territory yet unoccupied and very imperfectly surveyed left all sorts of gaps and omissions, which have now, per force, one after another to be, made good."

As a matter of fact, the cumpulsory method in Great Britain, which supplanted a steadily progressing voluntary system, has not brought the relief expected, but has undoubtedly created hardships. The benefits are so small that to the American workingman they would mean next to nothing.

Even in Germany, where the citizen is accustomed to regulation and discipline in all matters by the government, the compulsory arrangement is admittedly still in the experimental stage. In democratic France effort to develop compulsory invalidity insurance, met such resistance that the government was unable to secure enforcement of the measure.

We have not as yet adequate actuarial data upon which to base health insurance. The crude estimates made in the interest of the pending legislation on the subject purport to be based on Austrian, German and English experience, particularly the first. No careful

person can assert that they can be applied to this country; nevertheless, they are set forth impressively with a view to influencing American legislators.

American insurance companies, which in the last four years have been experimenting tentatively in health insurance, are doing so at considerable risk, which will continue until they have sufficient data to develop the field on the sound principles of other lines of insurance.

The American Fraternal Experience Commission has collected through the fraternal insurance associations all data available representing 268 occupations; their aim being to establish the data upon which any system of social insurance might have a scientific foundation. This commission, representing a combined membership of three millions, has been striving since 1908 to develop logically classified statistical tables. Each society sought information from every member, and this brought over a million cards for actuarial use, and it is proposed to develop five millions in all. The classification of the data of peculiar occupations involved enormous effort. A plan is under way to add the experience of other insurance funds; but until this is accomplished the commission will not claim to have reliable information upon which to predict calculations or build up a system of health insurance. The commission evidently regards it as foolhardy to foist upon the United States "half-baked" recommendations as a panacea.

That this country must steer clear of the compulsory system is the view of leading trade unionists who have given the subject consideration.

A fundamenal fact is that in the United States there is no such general extreme poverty as in England, where the low wage level makes it impossible even for the thrifty to provide medical care, not only during times of stress, but ordinarily.

Statistics for 1913 show that 63% of the railroad employees in Great Britain receive less than $6 a week wages. In 1915, of 588 women chain makers only seven made more than $3.27 a week, while more than 400 received from $1.22 to $2.43 a week; earnings which, while not all representing the hours of a full week, indicate the incomes of these workers in their especial industry. Of 74 men chain makers in one category coming under the minimum wage act, 24 were making in 1907 less than $2.75 a week, while among the other 50 the highest wage was $5.75, and most of the rest drew $4.86 to $5.60. In the ready-made tailoring trade, wages for 58% of the women, as affected by the act of 1907, ran less than $3.40 a week, only 10% earning more than $4.62. Of men in the same trade, 24% in 1906 earned less than $6.10. It is unnecessary to give figures showing wages much higher in America, because it is too well known to be questioned. While there is a great need for an increase in certain trades, it is also recognized that in many instances wages here seem almost fabulous to workmen in the same industries in England.

Warren S. Stone, Grand Chief of the Brotherhood of Locomotive Engineers, represents an order having the greatest voluntary insurance fund in America. It illustrates what may be accomplished by voluntary effort under a reasonably high wage scale. He represents the views of labor in general in this statement: "Instead of trying to bail a leaky boat, we should stop the leaks—begin at the other end and pay a living wage. The whole idea of the workingman is to avoid paternalism."

Americans have held out to them the beneficient results of the British system but little is said of the low amounts paid to the insured. Quoting from the report of the Committee on Preliminary Foreign Inquiry sent by the Social Insurance Department of The National Civic Federation to study the British National Insurance system, the following is illuminating:

"The maximum payments, expressed in American terms, are: Sickness—for men, for 26 weeks in 52, per week, $2.43; for women, $1.83. Disablement (invalidity)—for either men or women, after twenty-six weeks of sickness, per week, $1.22. Maternity—a lump sum $7.29. Unemployment—the first week without benefit and for only fifteen weeks in fifty-two, per week, $1.70. Old age pension—beginning at seventy years of age, per week, $1.22."

In contrast with these small sums as benefits, significant of the wage and poverty line of the British working class, stand the figures that illustrate both benefits and wages in the United States. The Report of the Commissioner of Labor, 1908, describing the voluntary establishment's funds promoted by employers, says that of 461 investigated, 429 paid temporary disability benefits, the predominant weekly rates being $5 and $6, from twice to three times the British rates. An official report of the Amalgamated Association of Street and Electric Railway Employees of America, with 70,000 members, states that in 1915, 89 divisions paid in sick benefits $55,725. Other divisions take up "barn collections," which for the Chicago division alone amounted to $31,000 for sick and disabled members. The sick benefit is usually $1 per day. The International Typographical Union, with 60,000 members, encourages printing office benefit funds, those of New York paying $8 to $10 weekly. This union's old age pension is $5 per week, the total paid out in 1915 being $297,340. The death benefits were in addition $249,600. Average earnings $1,026.51. The statistics for these unions are typical, it is true, of the higher paid wage workers of this country. Earnings, union scales, and benefit features fall away gradually as the employees in any occupation become more and more foreigners. But this diverse mixture of the American wage working class indicates a most serious difficulty in adjusting any system of social insurance to the general mass. In Great Britain, on the other hand, the extreme difference in wage levels, as that between the building trades day laborers and the newspaper printers, is less than $5 a week. Here it reaches from 10 to $15.

James P. Holland, President, New York State Federation of Labor, speaking of the attempts to get him to endorse the health insurance bill recently introduced in the State Legislature, and his refusal to do so, brings up another line of reasoning that influences the American workingman against State sickness insurance. He says: "Quite a number of our organizations have sickness and death benefits; some have sickness, death, funeral, out-of-work and tool benefits. We prefer our own insurance funds in the trade unions; if the employers paid enough wages, the men could join their own funds and save in that way to take care of themselves when sick. The laboring people also oppose this proposed health insurance law because it might break down the workmen's compensation law. I don't know any laboring man who wants sick benefits from the State, especially if he has to pay for it."

It is represented that "universal health insurance" would result from this proposed statute, though its provisions indicate that universality is merely to be *made possible*, recognition being given of the necessity for certain voluntary supplementary groups—an inconsistency, since the statute could not cover the entire population with its supplemental provisions. It is generally supposed that all the workmen of the kingdom are covered by the British system, while one of the first revelations in our commission's report is that the act is not general in its application. The sphere of compulsion to be insured is confined to wage-workers having employers who can be successfully compelled to act as collectors of the insurance dues, or as they are termed in Great Britain "contributions." This method omits from the insurance twelve to thirteen millions, and no one is included in the insurance scheme who has an income of 160 pounds a year or over. In all 70% of the population is exempt.

The wage-worker finds that the terms and conditions of his State insurance are not the same as when he insured with a company or fraternal or other society. In dealing with any of the latter, an insurer has choice as to the amount to which he will insure, he can drop out at any time, and he pays a rate based on the average risk incident to the class in which he is placed by such circumstances as age or hazard. His State insurance scheme, on the contrary, gives him no choice. He can insure only for flat uniform benefits accorded to all the insured who fall in his class under the act. He takes on burdens aside from the financial. His relations with the public authorities, his employer, his benefit society, his doctor, and the weaker members of society have all been changed. If healthy, sober, thrifty, and a skilful artisan, he has paid a high price in the loss of various personal rights—of the right to be free from police interference when selecting his own methods of thrift, of the right to prevent an employer from making deductions from his wages, of the right of membership in a sick benefit society, having liberty of independent self-management, of the right of an unrestricted selection of a doctor, and of the undoubted right not to be saddled with an unfair share in the support of the mass of chronically sick, or sham sick, or self- deceived as to sickness and other such known burdens of society in the helpless classes who would be forever "on the benefits."

It may be argued that the proposed legislation is developed along the lines of the German system rather than those of the English, but the compulsory principle is the same. Germany has had the longest experience, and despite the problems still to be encountered it is said that the sickness insurance fund has withstood the severe test attendant upon the war, which took the capable to the front and left those whose physical condition was less favorable, to make a higher demand on the fund. This speaks well for the solidity of that method as worked by a monarchial bureaucracy upon the powerless masses, but does not prove its applicability under a democratic form of government, where the whip of a master class cannot be applied.

Constructive Advertising.

By JOHN W. LANSLEY.

The word "Advertising" means more than the mere giving notice of the place and date of a coming event, more than public announcement of the quality and price of an article or service offered for sale. Within recent years, advertising has taken on new and increased importance in the business world, until it now embraces every discoverable means of spreading information that will influence prospective buyers or sellers of anything under the sun that is proper for trade. It is in this broad and general sense that the subject must be considered if intelligent use is to be made of it in the gas business.

Starting out, then, with the idea that the purpose of advertising is to give information, by whatever method of action or speech will reach the prospective customer most effectually, there follows naturally, when the work is well done, the much-desired publicity and knowledge in the public mind of the facts presented. From such publicity grows the reputation or character imputed to the person, firm or corporation engaged in business. No business can exist without some kind of publicity and reputation. No successful or satisfactory legitimate business can continue to exist, as such, without a good reputation, which, though it must be founded on sound principles, can be gained only through publicity.

A simple definition of "Constructive Advertising," therefore, is: The use of those methods of conveying information concerning any business, which will form and fix in the public mind sufficient knowledge to give such business a good reputation.

In this light, the subject is without complexity and is not capable of being misconstrued.

Opposing Forces in Publicity.

In publicity affecting the gas business, as in every avenue of human effort, are two opposing forces—one seeking to build up, the other tending to tear down. The first may be termed "Constructive," the other "Destructive," and bearing in mind that the public intelligence without knowledge is neutral, it is reasonable to expect that that force having the greatest energy and persistence will prevail.

From the time when illuminating gas first came into use, more than a century ago, down to the present day when gas occupies such an important place in the domestic and industrial lives of the people, this industry has had a lot of advertising of one kind and another. Candor compels the admission that most of it has been of "the other kind"—not paid for, not ordered, not wanted—advertising of the type that tears down, destroys confidence, plants alarm and suspicion in the public mind, retards development of the business, and causes many persons to forego the full benefit of one of the greatest blessings ever conferred upon humanity by inventive genius and industrial enterprise. In treating the subject of constructive advertising, as applied to the gas industry, it is expedient to take note at the outset of some of the destructive agencies of publicity which have exerted and are still exerting an influence as harmful to the people indirectly as it is to the gas business directly.

The strong popular protests made against the introduction of illuminating gas, both in England and America, are matters of history. This valuable invention, like many others, was denounced in public discussion, attacked by officials, opposed even in scientific circles. Public timidity and ignorance were so worked upon in this uproar of antagonism that for generations there were many and to this day there are still some, fearful of this benign and economical fuel and illuminant. All through the early years and well toward the present time, the gas business suffered from the gratuitous destructive publicity that gave gas a place among the dangerous, unclean and undesirable things by which humanity must be, of necessity, afflicted.

In those days printer's ink was not as lavishly used as now. The most potent advertising medium was the "word of mouth" route, by which information, whether true or false, was passed through whole communities and handed down from father to son, but even the small amount of printed matter relating to gas was often of a defamatory nature, over which we now smile with amusement. While we smile, however, over the once-prevalent error and misinformation, we realize, with regret, that there is little or no record of any effective constructive advertising having been done to correct those false impressions. Gas seems to have had no champion during the years it was battling against the bad reputation given it by its mistaken opponents. Without the aid of advertising other than its own accomplishments, the gas flame itself waged the contest for public esteem until it won, finally convincing the world that it is safe, clean and efficient—but it took almost a hundred years to do it.

Gradually, as prejudice against gas lessened, and the popular demand for it increased with its better reputation, there came into existence another form of destructive advertising, a continuous and insistent spreading of the idea that the price of gas was extortionate. Appealing to the cupidity that is natural, in greater or less degree in all men, certain forces began to preach a gospel of greed, while pretending to condemn it, always clamoring for a lower price, no matter what the existing price or how unjust the demands, and ever decrying the honesty of the men in the industry. By silent persistence the gas flame was able, though handicapped by early imperfections in methods of manufacture and in appliances, to establish a reputation for efficiency—but it never will be able, unaided, to overcome the clamor for cheaper and still cheaper service, a clamor that can be modified and made reasonable only by the intervention of some human effort. The price of gas has declined steadily and consistently with cheaper production and larger sales, while the price of nearly every other commodity has been going up. Nevertheless, the clamor for lower rates has not diminished.

In the absence of constructive endeavor to give the public correct information on the facts that have a share in fixing the price at which gas can be sold, the growth of the idea that consumers are overcharged is not surprising. Funny men and jokesmiths have accomplished much in the way of advertising gas companies as thieves, and gas meters as dishonest devices. Literary scavengers, lacking the gift of humor, have not scrupled to float their product by imputing high crimes and misdemeanors to gas enterprises in general. Ambitious politicians and notoriety-seeking demagogues have not hesitated to do much "constructive advertising," or fence building, on their own account in their struggle for fame and fortune.

Finding the public mind neutral because of lack of information, and receptive because of its natural rapacity, ambitious writers and speakers have been quick to grasp their opportunity—much more enterprising in this direction than the men who have invested something near a $1,000,000,000 in the artificial gas business in the United States.

The American political system, in default of constructive advertising on our part, encourages all officialdom to be antagonistic to our business. It is not often that we find a public official brave enough and strong enough, in the face of popular outcry, to stand up for a square deal for a gas company or other public service corporation. Mere reasonable regulation, to which no honest man can object, and even drastic and burdensome requirements imposed upon the company, do not bring the vote-getting answer without publicity branding said company a sinner and some one else the self-appointed savior of the people.

Thus, we are not only constantly harrassed by unfair and sometimes ridiculous rules and requirements prescribed by municipal and State authorities, but are compelled to proceed with the sale of our product and the development of our business under a continous avalanche of destructive and often abusive publicity that gives no heed to the facts, nor to the preponderance of virtues or faults we may possess. Politicians consider this subject of reputation so important that it is unusual to find a governor, legislator, mayor, or other elective officer who is not better equipped to do his own advertising than is the average gas company within his jurisdiction. When we observe the frequency of public attacks upon our business, founded as they are, in nearly every instance, on misinformation—when we note the success of nearly every politician who uses these methods of advertising, even though his success may be merely temporary—when we feel the general restrictive conditions of public regulation that prevail to-day—do we not find the proof that we have neglected telling our side of the case, neglected the publicity which would have given us the good reputation to which honorable dealing and good intent entitle us?

One other form of advertising inimical to the gas business is important enough to be mentioned here, though it is legitimate when honestly done, and is not to be classed with the forces previously described. It is the publicity work of our competitors, those deal-

ing in commodities that may supplant or be supplanted by gas. Gas companies, with few exceptions, have done more or less effective advertising in meeting this competition, but the balance of effort is still greatly against us. While we have been active for several years in advertising appliances, and occasionally speaking a good word for gas, the destructive element has been industriously shooting holes in our reputation as public servants and square-dealing business men. It is through a desire to secure deserved public recognition of our struggle to give the best possible service at the lowest possible price—within such limitations as any sane business man may reasonably expect—that we are led to the discussion of "Constructive Advertising."

We Must Come Clean.

It would be worse than useless to undertake publicity without clean hands; that is, good service to give at a fair price. To the honor of the gas fraternity, it may truthfully be said that this condition is general throughout the country, and the city where it does not exist is an exception.

All the elements of good service are of themselves important features of publicity, and may be properly considered here. Good gas delivered to the burner according to the best modern practice is an efficient advertising medium, though not generally listed under that head. For a long time it had to do all the talking done for the gas business, and is doing the most of it to-day. Courteous and skillful employees, from meter-readers and fitters to cashiers, all have unlimited opportunity to advertise their company by doing their work well and treating the public with the consideration due to every man who pays money for any commodity or service. Good management is, for this reason, very careful to foster and promote not only respect and civility from subordinate to superior, but also polite and just consideration of the subordinate by his superior. How often is the hasty or ill-timed criticism of same employee handed on from one to another, clear down the line, until it reaches the man in direct contact with the public and by him is shunted off onto some hapless customer in some form of grouch or bad temper! The internal workings of the whole organization may exert powerful advertising influence for good or bad, determined by the managerial policy.

Every rule of action designed to add to the convenience, safety and general satisfaction of the customer is constructive advertising, and has a definite value in fixing the company's reputation. But the forces of good service and square-dealing are sluggish when not talked about, and even when there is no counter force to lessen their effect, many years are required for them to fix themselves permanently in the public consciousness.

People are interested chiefly in the product of their own energies, are careless of the good work of others, and gradually come to ignore or forget the value of the things that are easiest to obtain, most constant in character and cheapest in price. When to this phase of human nature is added the irritating, confidence-destroying, suspicion-breeding voice of the destructive demagogue and political aspirant, it is not strange if thousands of consumers believe they are ill-treated by public service companies, no matter how good the service rendered or how low the price charged.

If the destroyers flourish amidst the people's lack of information, why should we, who know, permit the people to remain in ignorance of the facts?

If we are devoting our energies to giving the best possible service at the lowest possible price, why should we allow the people to forget it?

When they know, the people are just, even in spite of their inclination to get the best of a bargain. How we shall make them know and not forget, is the advertising problem of the day.

It is interesting to look over the internal conditions in the gas industry and the operations of the enemy simultaneously. Select any American city where the heating value and purity of the gas supplied are at the highest point commercially possible, and you will find a considerable part or the population firmly convinced that the quality is below standard. They have seen it so stated in print somewhere by somebody.

Take another city where extraordinary investment has been made to create a perfect distribution system, and there you will find official opinion and popular belief that the mains and services are inadequate. It has been so stated in print somewhere by somebody.

Choose another city where the meters are new, carefully tested and accurately read, and there, as likely as not, is the greatest complaint of "crooked meters." The complainants have seen it stated in print somewhere, by somebody, that meters are crooked.

Choose still another city, where the managerial policy requires from employees the most scrupulous politeness and attention to the public convenience, and there the charge of ungracious treatment will be frequent and insistent. Somewhere the people have read that public service employees are surly and uncivil.

And select yet another city, where the price of gas is abnormally low, and there the clamor for still cheaper gas is perhaps the loudest, because the people are continually reading somewhere, the statement, by somebody, that the price is exorbitant and the company is robbing the public.

The enterprise that is financed with most difficulty does not escape suspicion of melon-cutting; the company that may have earned nothing for the stockholders is censured because of supposed unreasonable profits; the undertaking managed with greatest care and economy is criticized on the ground of alleged wastefulness. If the people, even high officials on occasion, are made to believe these errors by the power of printer's ink, can they not be made to believe the truth through the same agency? Constant repetition of half-truths and untruths by assailants of public service companies have cost such companies the good opinion of many sincere and just persons. Constant repetition of the simple truth cannot fail to establish good opinion and preserve it unwavering.

In constructive advertising designed to place the gas industry in its proper light before the public, it is not necessary to do violence to any established usage, further than to remember that the sale of appliances, which, up to the present, has absorbed our advertising energies and appropriations almost entirely, is merely incidental to the gas business, and differs in importance according to local need. A gas company is primarily in the business of selling gas. In most cases, the handling of appliances by the company is a very powerful aid in this work and should not be neglected in advertising. But it should never be allowed to overshadow the main performance in the big tent.

Advertising appliances is "constructive," so far as the appliance business is concerned; shown by the popularity of the gas range, for instance, and the fact that nine times out of ten any shortcoming or poor adjustment of the range is blamed on the gas. To the extent that it increases the "send-out" and benefits the consumer, appliance advertising is a valuable assistant. Beyond certain limits, however, the returns from this advertising are problematical. When sale activities reach the stage, as it often does, of expending large sums of money to induce hundreds or thousands of gas users to exchange old appliances for new ones, when the old ones may be still serviceable, it is doubtful indeed whether the result justifies the cost. The most interesting curve on the chart in the new business department is the one that shows the daily sales of estimated new consumption, rather than the one that shows the number of appliances disposed of.

Things the People Should Know.

To obtain satisfactory results from advertising, it is essential to convey to that part of the public not served in whole or part of their everyday need, information that will convince them that gas service is desirable for all the "thousand and one uses" to which it may be applied, and that it is cheap. In doing this, we will find ourselves perpetually emphasizing all the things gas companies are doing to give good service at reasonable cost.

The desirability of gas as a fuel or illuminant depends upon the combination of many elements of service, every one a suitable topic for advertising and public knowledge.

Good gas requires large investment for works equipment, competent engineering and superintendence, constant care and attention, regardless of the time and labor expended or the variable cost of production. The standard must be and, with few exceptions, is always maintained.

Good distribution requires, as a rule, much larger investment than for works equipment, the same high degree of competency in engineering and superintendence, the same sleepless care and watchfulness. In addition to this, distribution involves financial ability and liberality in expenditures to lay miles of new mains and service lines that never become profitable to the company.

Progressive policy—that is, the spirit of service and co-operation with the public, which should animate every gas company—embraces correct accounting, courteous demeanor, willingness to accommodate, anxiety to please, the introduction of every known method of promoting public safety, convenience and economy. These things should be the gospel of the modern gas company.

Reasonable price is any price that will produce enough revenue to enable the company to maintain first class service and make a fair profit, and low enough to enable the people to use gas with profit to themselves. Somewhere within these two limits is the price at which gas must be sold, fixed by two great fundamental

requirements: high enough to preserve the industry and low enough to develop the business.

The cheapness of gas is evident to every consumer who can be induced to give thought to the value of the service he receives, in comparison with its cost to him. Recently, in a great American city where gas is used in more than 40,000 homes and business places and sold at $1.00 per thousand, it was found that 51% of the users pay an average of less than $1.00 per month for their service, and the average paid by all consumers, little and big, is less than $2.00 per month. This condition exists, with slight variations, in every town and city supplied with gas. When we consider, in connection with this extreme cheapness, the extraordinary character of the service rendered—the convenience and efficiency of gas in the home, shop and factory, its cleanliness and sanitary value, its constancy, safety and dependability, the time and labor it saves, the comfort and happiness it promotes—when all these things are taken into account, it is not unreasonable to claim that gas is the cheapest commodity man has ever produced for his fellows.

In advertising the cheapness and desirability of gas service, we legitimately touch upon large initial investment, heavy interest charges, increasing taxation, slow turn-over of capital, rising prices of materials, uncertainties of labor, physical and legal hazards, adverse legislation, competitive influences, depreciation of plant and constant demand for new capital to finance extensions. These are only a few of the more important ingredients—there are many others—all having a direct bearing on the character and price of the service. Such facts may be presented to the public in a great many effective forms, all applicable directly to the effort to dispose of our product.

Advertising gas service is, therefore, necessarily "constructive" in its nature. By this means the public is given information that will cause it to form a just opinion of the gas business, and without which, destructive influences may and no doubt will continue unchecked. It is not exaggeration to say that every gas manager believes that if he could fix in the public mind a clear knowledge of his difficulties, his motives and his sincerity, he would have from that source help and not hindrance, co-operation and not resistance, respect and not suspicion, and it would be no longer possible for anyone to gull the people with assertions that gas companies are robbers, extortioners and crooks. Under such conditions, many a demagogue would have to find another subject.

Daily Newspaper the Best Medium.

The sum to be expended for advertising, the mediums to be used and the manner of their use are determined by local conditions. It would be idle to undertake to lay down rules on questions of detail that may be viewed from a thousand different angles. In such matters one can only express his opinion formed after such experience as he may have had, and to which experience there may never be an exact parallel in his own or any other man's affairs.

Of the various kinds of printed advertising matter, cards, folders, booklets and signs, all have value when opportunely and economically used, but the great modern medium for advertising, outpointing all others in height, breadth and reach, in influence, flexibility and economy, is the daily newspaper. Many of you have experienced what it can do when your enemy speaks through it and you do not. The daily newspaper is as constantly at your service as you are at the public's service. Space in it, when used with good judgment, is relatively cheap. People read advertisements; the great mercantile establishments of the world have proved it. Advertisements relating to public utilities will be more generally read than others, because public service is always a live topic. The daily newspaper is the medium through which reputations are made and unmade to-day. The man who offers the fairest deal often has caluminators, and if he remains silent the popular verdict will be against him by default.

Newspapers reach everyone who reads. They speak to users and non-users of gas alike, and it is as important to retain and stimulate old customers as to gain new ones. The personal characteristics of the people of any city—their tastes, habits, culture, condition—give such city a certain composite individuality, indefinable but very real to one who has sensed it. It is to this individuality that the writer of constructive advertisements devotes the most of his attention. He cannot speak to any one class alone, the learned or unlearned, the employer or employe, the rich or poor, the professional man or tradesman—but must speak to all, remembering that what he says to one class will be read by all.

The best results follow simple, candid, sincere statements of fact without any attempt at "clever" or "smart" writing. Cleverness and smartness are entertaining, but will not sell gas, or improve the company's reputation for fair dealing and honesty of purpose. In advertising, much depends upon so-called power of expression—as distinguished from facility of expression—the use of common words and phases, not those obscure to the average person or composite personality of the public, and arranged to state facts so clearly as to leave no possibility of misunderstanding.

It is possible to adhere so closely to self-evident truths in advertising gas that an adversary can find no opening for challenge and argument. Good advertising conquers by persuasion, not by fighting, and he who is invulnerable in performance and utterances is seldom attacked.

Self-respect and dignity may be as plainly expressed in an advertisement as on the human countenance. Servile flattery of the public, and flippant wit are most valuable when omitted.

A corporation will speak modestly if its words are to have weight. The purchaser is the monarch, he who has money to spend.

It does not help the company's reputation to put up a luxurious front and assume financial airs. Investors know how to read monthly statements and the people usually suspect that a public utility is making larger profits than it claims.

Brief statement, without useless words, holds attention, but overdone brevity produces an irritating staccato effect and often causes a break in the line of thought. It is better to present one idea at a time, and try another the next day, rather than jumble them together. All eternity is before us.

The space to be used is determined by the make-up and general advertising character of the paper. Well-made advertisements are pleasing to the eye and are relatively prominent. Prominence may be secured by contract, not necessarily by size.

The use of more space than is necessary wastes money, and sometimes offends the reader. Striving after oddities in type composition usually results in grotesque effects A salesman standing on his head attracts attention, but it is not considered good practice in the gas business.

By the use of type a few sizes larger than that in which the news portion of the paper is printed, an advertisement is made restful to the eyes, and its chances of being read through are multiplied. As a rule, 10-point or 12-point type is large enough for the body of a newspaper advertisement.

Headings may be made to stand out distinctly without using poster type, as any good printer will demonstrate. Here again, it is contrast that counts.

When the heading of an advertisement consists of a half dozen or less short words, and makes a complete statement of an important fact concerning the business advertised, it is a good heading. It is covered in a glance, and if the reader never sees another word of the advertisement, he has absorbed at least one point, the principal one if the heading is right.

Irrelevant headings of the "Stop, Look, Listen" variety are excellent as warnings at railroad crossings, fire stations and contagious disease hospitals, but may be omitted from gas advertisements without spoiling the effect.

Sub-headings which "connect-up" with the thought expressed in the main heading, give the hurried reader a synopsis of what is being said, though he skip the body of the advertisement entirely. When the whole story runs smoothly and without jar from beginning to end, the reader is very likely to believe it if we stick to the truth.

To go on with the innumerable ways in which constructive advertising may be done effectively and profitably would be wearisome. Enough has been said to show the opportunity for this work, and that it is a man's job.

What is said in a newspaper advertisement has an audience of thousands. It is equivalent to the manager appearing in person and making a two-minute speech about his business to a great concourse of intelligent beings. Under such circumstances he would choose his words with extreme care, presenting only facts that cannot be disputed or misunderstood.

The writer of advertisements of the kind under discussion fortifies himself, therefore, with complete knowledge of his subject, a breadth of understanding that will enable him to give the public clearly and without confusion such information as they demand and are entitled to; avoiding every possibility of embroiling his company in altercation, and leaving no loophole for challenge as to its truthfulness and honest intent.

Repetition, and still further repetition, will be required, but just as surely as the gas industry has been unjustly hindered and punished by destructive publicity in years past, so surely will the ill effects be overcome in future by a general policy of constructive advertising. Out of it will come the good reputation this industry long ago earned, but which, to large extent, is still unclaimed; from it will result confidence and co-operation from the public, and the disappearance of unfair criticism and adverse legislation.—*Paper to the Illinois Gas Association.*

Depreciation as an Element in Rate Making.

By JARED HOW.

[From argument against the consideration of accrued theoretical depreciation in the cost to reproduce a utility, before the California Railroad Commission in the case of the Northern California Power Company.]

All expenses incurred by the owner of a public service property, whether for operation of the property or maintenance of it, stand upon the same footing. They are all incurred in the performance of its obligations to the public arising under its franchise, of which the obligation to operate the property is no more nor less firm than the obligation to keep it in adequate condition for operation. And all such expenses are incurred because of the consumption, by the owner of the property, of some thing or other in producing the service to the public. It may take twenty minutes to consume a barrel of oil used for fuel, and it may take twenty years to consume a steel rail in a railroad track. But whatever the period of time required for the consumption, and whatever the method through which the consumption progresses, the result is the same; and whatever is consumed must be replaced by the owner of the property by virtue of its obligation to the public—the steel rail to the end that the property may be maintained in adequate condition for operation; and the barrel of oil to the end that, when so maintained, the property may be continuously operated; and each of them and both of them to the end that the public may be assured of the sufficient and continuous service contemplated by the grant of the franchise under which it is rendered.

But barrels of oil are consumed rapidly and must be constantly replaced; while steel rails and other things used by public servitors, such as pipes, machinery and so forth, are consumed slowly and are required to be replaced only at long intervals. If they could be replaced proportionately, from month to month, or from year to year, the expense of replacement in each month, or in each year, would be comparatively trifling; and, if collected as needed, would not be a serious burden upon the public which has to endure it. If, on the other hand, the collection by the owner of the property from the public, of the amount necessary for replacement only at long intervals should be deferred until the year in which replacement should become necessary, the result would be such a great inequality in rates as would impose a serious burden upon the public.

Therefore, in order that rates may be equable from year to year, it has become recognized as proper practice to permit the amount necessary for making such replacements to be collected by the public servitor from the public (if it can be done through rates which shall not be unreasonably high) in the same manner as if the replacements could and should be made proportionately from month to month, or from year to year, and to preserve the amounts so collected in what is commonly called a depreciation fund to respond for the expenses of replacement when it shall become necessary to incur them.

The amounts necessary for a proper depreciation fund are measured by what is sometimes called accrued theoretical depreciation—that is to say, theoretical depreciation estimated for the period which the fund is designed to cover, and based on the diminution in the length of the original period of service-ability of the various items to which it is applied.

It is perfectly obvious that the so-called theoretical depreciation is not depreciation at all; and that it is merely progress toward the necessity for expenditures for maintenance. It has nothing to do with deterioration of the composite plant, considered as one entire instrument for the performance of the obligation to render the service to the public which its owner had assumed.

It is equally plain that the so-called depreciation fund is not a depreciation fund at all; and that it is merely a maintenance fund—a fund accumulated for use in the future to provide for the expense of the owner of the property, which must be incurred, in performing its obligation to maintain the property, at all times, in condition such that it will sufficiently render the service for which it was installed. So long as that obligation is performed, the property employed in the service never deteriorates in efficiency and, therefore, never depreciated in value for the only use by which its value may be estimated, because the only use to which it may ever be put—the service to the public for which it was enlisted under the franchise which covers it. And it seems to follow decisively that, so long as that obligation is performed, the value of the use of the property, as between its owner and the public which it serves, never can depreciate.

It is perfectly clear, further, that, inasmuch as this so-called depreciation fund has been collected from the public by the public servitor for the purpose of providing it with money to meet the expense of replacements when, from time to time, they shall become necessary for the maintenance of the property, the fund can be used only for that purpose. [Louisiana Railroad Com. vs. Cumberland Tel. Co., 212 U. S., at pages 424-5.] It is a quasi trust fund for the performance of the obligation of the public servitor to the public to keep the property devoted to the use of the public always in a condition of complete efficiency. If it were in fact a depreciation fund, instead of a maintenance fund, its function, of course, would be to compensate the owner of the property for the loss which it has sustained in the depreciation of the value of its property necessarily involved in rendering the service to the public—to amortize the investment so far as that depreciation in value has progressed. If that were its function, the amount in the fund would, as collected, be distributable to the stockholders of the owner of the property to indemnify them for loss in their investment. The fact—and nobody will contend that it is not a fact—that the so-called depreciation fund may not properly be so distributed, but that it must be used, and used only, for replacement of such portions of the property as shall have been consumed in the service, is a complete demonstration to the conclusion that the fund provided for the payment of the expenses of operating the property.

The proposition that the obligation of the owner of the property grows toward maturity in precisely equal proportion with the progress toward destruction of the respective parts of the property to which the obligation attaches, seems to be mathematically exact; and, if accrued depreciation, at any time, of any such integral part can properly be said to exist and to be measured by the proportionate amount at that time of its progress toward destruction, it seems to follow, with mathematical exactness, that the accrued obligation of the owner to replace such integral part when it shall have reached the end of its progress toward destruction, must also exist at the same time, and must be measured by the same standared. If, then, the amount of "accrued depreciation" and the amount of "depreciated reproduction cost" of any privately owned public service property, make, together, the amount of the "cost to reproduce" the property, the conclusion is not to be avoided that the amount of accrued obligation to replace of the owner of the property and the depreciated reproduction cost of the property make together the cost to reproduce the property.

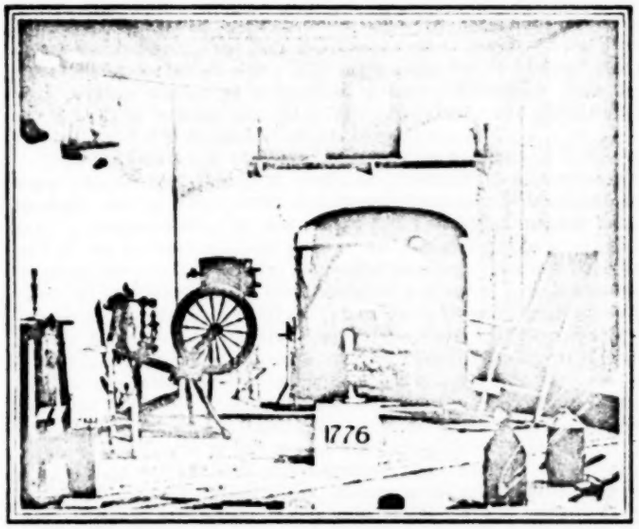
The fair value of the property at the time of its use must mean its fair value in the service rendered by its owner, and not the fair value for the purpose of taking it out of that service; and, in view of what has been said with regard to the franchise obligation which attends privately owned public service property, it must mean the fair value of the property with the franchise obligation which covers it, and not its fair value stripped of that obligation. It must mean, therefore, the fair value of the property with its attribute of eternal life, and not its fair value without that attribute but subject to the ordinary tendency to destruction.

Theoretical depreciation is based, not upon actual deterioration of the property to which it is applied, but upon its liability to deteriorate; and it is measured by the progress toward the end of serviceability of integral parts of the composite property, avowedly upon the theory that, when the end of that serviceability is reached, the value of the composite property will, on that account, be lessened. But, as has been demonstrated, that theory is utterly unsupportable; because, through intervention of the franchise obligation of its owner to maintain the property at all times in a condition of entire adequacy, the integral parts of the composite property which are subject to destruction must be replaced before they reach the end of their serviceability, and before their lack of serviceability may impair the value of the composite property. Considered merely as integral parts of the composite property—and that is their only function—they may never perish. They must always live—and live with full vigor. Theoretical depreciation, therefore, is based upon a tendency to destruction, and is measured by growth toward destruction, neither of which has any existence.

The conclusion is not to be escaped, then, that lessening the fair value of privately owned public service properties by the amount of accrued theoretical depreciation, for the determination of the "basis of calculation" of the just compensation to the owner for the service rendered to the public, results in confiscation from the owner of just that amount of "the value of that which it employs for the public convenience."

More Westchester Windows.

Educational Show Window Advertising, that Proved Very Effective.



The School Children of Yonkers visited this Show Window as part of their work during Washington's Birthday week.

Two distinct types of windows are shown here as examples of window dressing in the offices of the Westchester Lighting Company at Portchester and Yonkers, N. Y.

Largely owing to the general public interest in munition, steel and other factories, the methods and the materials used in the manufacture of a gas range command much greater attention than has been the case. A miniature cupola with samples of pig iron, coke, lime stone and moulding sand are seen at the left, while the operation of grinding and cleaning, together with samples of parts in the rough as well as finished are arranged in the center window. At the right the picture is completed with a range connected ready for use. It is important to note that the sample range selected has glass doors and white splasher, two things that add to the value of the installation to the woman who has an older type, as well as to the one still using a coal range.

The Colonial window proved to be an excellent example of the adage concerning the truth that "If you build a better mouse trap, etc.—the world will make a pathway to your door." In this case the pathway was made by school children brought by their teachers that they might have a better idea of Washington's time. The fireplace shown is an exact duplicate of one in the Van Cortlandt Mansion, New York City. This type of advertising has a great value to most gas companies, and was of usual value in this case as the showrooms at Yonkers were only recently brought from darkness into light. They have been moved to the main shopping center of the city.

Testing Salesman and Territory.

Last spring the United Gas Improvement Company tried some experiments to determine the relative values of the various sales districts in Philadelphia, and to demonstrate them to the salesmen.

The plan was to concentrate the 14 district salesmen into each man's territory for two hours in the afternoon, on two days. On Monday, Wednesday and Friday afternoons, from 3 to 5 o'clock. the salesmen would meet at a point designated by the representative whose district was to be canvassed, and the streets to be canvased and the nature of the appliances to be sold were decided by him. The plan gave each man an opportunity to show his ability to sell, and also his skill in mapping out a campaign. On the day previous, advertising matter was delivered throughout the district, to arouse interest in the appliances to be offered. In the canvass the men worked in couples, each pair taking one side of the street, and their combined efforts and arguments generally landed a sale wherever a consumer was at all interested.

Credit for the earnings of the entire force were pooled, and given to the representative of the district, as indicating the value of the district; and each man kept a record of his own sales in the 14 territories. The results for the period from April 26 to July 30 are given in the accompanying tables. Assuming that the same energy was expended in each case, these show that some districts are better than others, the two extremes being district "A," with 112 points and business to the value of $134.50; and district "I," with 631 points and business of $764.93. They also show that some men are better salesmen than others.

Record of personal sales in canvass of the fourteen districts.

Salesman.	Points	Amount.
A	296	$367.11
B	470.5	571.66
C	272.5	309.41
D	278	310.21
E	220.5	223.19
F	384.5	466.38
G	291	362.21
H	307	283.16
I	447	548.31
J	735	873.16
K	268	324.91
L	382	378.28
M	479	565.93
N	561.5	597.83
Total....	5,392.5	$6,181.75

Business taken in each territory by two canvasses by the fourteen salesmen.

Territory	Points.	Amount.
A	112	$134.50
B	537	706.74
C	299	351.85
D	443	474.63
E	426.5	380.00
F	330	318.39
G	304.5	349.05
H	464.5	547.23
I	631	764.93
J	198.5	216.53
K	340	392.60
L	338.5	439.00
M	386.5	419.23
N	581.5	687.07
	5,392.5	$6,181.75

The company feels that the total result of the work is not entirely covered by the data given, for one must consider the stimulus given by the combined work of the men as well as the psychological influence on the districts. Many prospective customers were developod and afterward canvassed to good advantage.

Telephone • John, 2996.

THE AMERICAN GAS LIGHT JOURNAL

Cable, • Am-Gas.

Entered at the Post Office, New York City, as Second-Class Matter.

SANFORD K. CAMPBELL, Editor.

Published Weekly by The American Gas Light Journal, Inc., at 42 Pine Street, New York City.

ELBERT P. CALLENDER, Pres. and Treas. FREDERICK A. SOUTHWORTH, Vice-Pres.

CHARLES H. WADELTON, Secretary and Manager.

NEW YORK, MONDAY, APRIL 3, 1916.

Institute Directors' Meeting.

The fifth monthly meeting of the Directors of the American Gas Institute was held at the Congress Hotel, Chicago, Wednesday, March 22d, at 8:00 P.M., and was called to order by the President, Wm. E. McKay, with the following present:

D. D. Barnum, R. B. Brown, R. W. Bush, Thos. Crawford, J. P. Crowley, S. J. Glass, R. B. Harper, L. H. Johnson, J. B. Klumpp, Herman Russell, J. D. von Maur, Geo. G. Rumsdell, Secretary, and E. G. Cowdery, Chairman, Committee on Arrangements.

The Affiliation Agreement with the New England Association of Gas Engineers was presented; also the new agreement of the Wisconsin Gas Association, both of which were approved, and the President and Secretary of the Institute authorized to properly execute them.

The President announced he had appointed Herman Russell Chairman of the committee to be formed on "Revision of Constitution and By-Laws"; and that Carroll Miller had been appointed Chairman of the Committee on "Securing New Members."

The report of the Committee on Public Relations, in the absence of the Chairman, Geo. B. Cortelyou, was read by J. B. Klumpp, Secretary of the Committee. Mr. Klumpp also submitted a report of progress, addressed to Mr. Cortelyou by W. R. Addicks, Chairman, of the Sub-Committee on "National Gas Safety Code."

D. D. Barnum, Chairman, submitted the report of the Technical Committee, covering the work accomplished in the procuring of papers for the October meeting. This also included a progress report of the committee on "Classification of Gas Engineering" and request for funds to finance that committee's work; which was referred to the April meeting.

A communication was received from the National Association of Railway Commissioners asking for co-operation in matters of accounting. Considerable discussion followed on the subject of co-operation and concentration of the work of the National Association, but with no definite action. The Secretary was instructed to obtain further information and report at the April meeting.

E. G. Cowdery, Chairman of the Committee on Arrangements, made a report of the work of the committee to date. The committee was of the opinion that it would add to the interest and value of the meeting if fewer sectional divisions were made and more of the papers read when practically all of the members were present, and that this could be easily accomplished if another day was provided, and suggested adding to the three usual days a fourth, opening the convention Tuesday instead of Wednesday. After a full discussion it was found that the idea was generally approved by the Board. The Chairman of the Technical Committee and Committee on Arrangements were asked to formulate a program for the meeting to be submitted to the Roard for its approval at the April meeting.

After which the Board adjourned.

New York Gas Meeters, Ladies' Night.

One of the underlying reasons for the Gas Meeters was very much apparent at the Ladies' Night, given by the New York Section on Thursday evening, March 30, at the Castle Cave, New York; formal as to dress but informal, or rather wholesomely democratic, as to the spirit that prevailed. The "Beefsteak" dinner was only an incident even to such delicate chaps as Al. Klein, Safety Stiles, Stan. Grady and George Millspaugh. The orchestra played that "I just can't make my feet behave" music, and everybodys' wife or sweetheart was ready to dance. So that there would be enough partners for all, Geo. Smith brought all of his wive's relatives and some of his own. Little Harold Humphrey directed the music and Mrs. Conroy gave Jim lessons. Chairman Chapple missed the chicken altogether, in fact, he was so busy that he forgot to call upon John Brock, Harry Peck and Hugh Aiken, to render their celebrated harmony in H. Yes, we all had a good time, as the speakers of the evening had dancilitus.

Others who contributed to the festivities were:

Jim Coles, Jim Benson, Adolph Berg, Theodore Pettit, Dan Ebbets, Tully Willson, Larry Schlosser, H. M. Monness, J. S. MacArthur, H. D. Gillingham, Alec. Sinai, A. B. Bartholomew and E. L. Schultz.

[OFFICIAL NOTICE.]

Pennsylvania Gas Association.

OFFICE OF THE SECRETARY,
WEST CHESTER, PA., March 20, 1916.

The Pennsylvania Gas Association has a cordial greeting for its members this year at Easton, Pa. The eighth annual gathering of the Association promises to go on record as one of the most instructive and important in the history of the organization. Our President, Mr. B. F. Cresson, is not only proud to have Easton open its hospitable doors to the Association, but is also proud of the organization that is going to honor Easton. The industrial establishments throughout the territory of which Easton is the center, will enable the members to see some of the latest installations where gas for fuel is playing such an important part in the production of munition output.

Important papers will be read, covering the latest developments in designing and selling gas lighting fixtures; also the most up-to-date selling methods for appliances. The list of papers and topics show the importance of every member putting aside his ordinary affairs for a day or two to attend this meeting.

The general program, as outlined by the Committee, is as follows:

Tuesday, April 11th, 6 P.M.—Council meeting, with dinner, as guests of the President—Pomfret Hall.

Wednesday, 10 A.M.—Business Session—Heptasoph Hall.

Wednesday, 3 P.M.—Automobile trip about Easton and new industrial plants.

Wednesday, 8 P.M.—Banquet.

Thursday, 10 A.M.—Business Sesssion.

Thursday, 2 P.M.—Business Session.

Thursday, 8:30 P.M.—Informal Smoker.

Friday, 10 A.M.—Business Session.

Friday, P.M.—Open for Challenge Game of Base Ball.

The Entertainment Committee are planning for a wide-awake, up-to-the-minute good time, starting Tuesday evening for the early arrivals.

On Wednesday, Thursday and Friday, the business sessions will include the following topics:

Short Talk on Public Relations, by J. B. Klumpp.

Report of Gas Fixture Committee, by W. A. Morris, Chairman (including Standardizing of Gas Fixtures, Co-operation with Gas Fixture Manufacturers, Merchandizing of Gas Fixtures).

Lighting Maintenance, by H. H. Newman, Passaic, N. J.

Service Combustion Lecture, by Dr. Lucke.

Thoughts on Merchandising by a Gas Company, by J. B. Myers.

Methods and Costs of Connection Appliances, covering Dispatching, by Oscar Heckert.

Transportation, by L. R. Dutton.

Box System, by George B. Bains, 3rd.

Inspections, by Howard Hoffman, Ardmore, Pa.

There will be a trip on Wednesday afternoon through the industrial plants of Easton, as the guests of the Easton Gas Works; and a banquet on Wednesday evening. On Thursday evening a smoker, "As-You-Like-It," will be an innovation in the usual form of entertainment.

The headquarters will be at the Hotel Karldon. Address all requests for information to E. G. Holzer, Chairman Entertainment Committee, Easton, Pa. Remember the dates, Wednesday, Thursday, Friday, April 12th, 13th, 14th, 1916.

SPECIAL ENGLISH CORRESPONDENCE.

Monthly Letter From Norton H. Humphrys, Salisbury, England.

THE POSITION OF THE GAS INDUSTRY.—GAS AND POLLUTION OF THE ATMOSPHERE.—DETERMINATION OF TOLUENE, ETC., IN TARS AND NAPHTHAS.

As the Reports and Statements of Account for the year ended 31st December, 1915, issued by the leading Gas Undertakings, together with the explanations offered in reference to them at meetings of shareholders are now on record, there is a possibility of arriving at some idea as to the effect of the special restrictions and regulations necessitated by the present condition of National and public affairs, on the progress and prosperity of the gas industry. They have been referred to in detail, in previous letters. The principal items dealt with, from the Chair, were the increased cost of freightage by sea, brought about by the large demand for transport shipping, as affecting the cost of coal delivered at the works; other causes tending to swell the price, not only of coal, but also of all kinds of material; restriction of exports as affecting the sales of coke, tar and sulphate of ammonia; the scarcity of oil of vitrol, and the numerous ramifications of the labor question. Sufficient prominence was not given to the position of gas undertakings regarded as a national asset, and the numerous services, direct and indirect, that they have been able to render to the State since the outbreak of war. The high rates for freightage are a very serious matter to companies entirely dependent upon sea borne coal, as in some cases they are equivalent to as much as one shilling per 1,000 cubic feet of gas manufactured.

The introduction of the female element as a means of filling, to some extent, the wide gaps in the employment lists, continues to increase, and as a rule, with satisfactory results. This applies not only to clerical work, but also to the lighter sorts of manual labor; and in one instance at least, women are doing the yard work, such as wheeling coal and coke or screening breeze. This will have the effect of introducing new conditions, of a more or less permanent character, in the labor market. It will not be practicable to summarily dispense with the assistance forthcoming in a time of stress, immediately there is a return to easier and happier conditions. Ladies of position and independent means have not hesitated to stand-in when their assistance was needed, and no difficulty would arise about dispensing with their services at any time. But the position is different in the case of wage-earners who have left other occupations now perhaps closed against their return. In addition, there are certain departments, hitherto occupied exclusively by male workers, to which the female character has proved to be more adaptable, and in regard to these the "Gas Lady" has certainly come to stay. The sales of gas have been prejudiced by restrictions in lighting and licensing, which now extend to the extinction of all outside lighting that can, by any possibility, be dispensed with, to the screwing down of necessary exterior lights to the lowest limit consistent with safety, and large reductions in the number of hours during which intoxicating liquors may be sold or consumed. Brightly lighted shops are forbidden, and the general result is that people do not care to go out after dark, and business is prejudiced to such an extent that earlier hours of closing are in contemplation. The scarcity of labor has limited the laying of new mains and services, as in some districts the whole available strength is required at the gas works, but in others the work of extension appears to be proceeding almost as in normal times. A satisfactory feature is, that while the causes tending to reduce consumption are of a temporary nature, those which go towards increasing it are of a more permanent character. Of these, the demonstration of the utility and advantages offered by gas in connection with many technical processes, may be mentioned. It has been adopted, temporarily, as being capable of quick application, but found to possess properties that render it preferable to other kinds of fuel, and generally, the special advantages of gas have been advertised to an extent that would not have obtained under other circumstances. Nearly all the companies working under standard clauses of price and rates of dividend have been able to pay the maximum rates allowed, as if they have not in all cases earned them, they are able to fall back on the reserve fund provided for the purpose of equalizing dividends. Those who are under the sliding scale have to accept a decrease in proportion to the extent of the rise in the price of gas, and therefore suffer by reason of the increased expenses above named. But the fact that while the average rise in working expenses is in the neighborhood of 40%, the advances in the price of gas range from 10% to 20%, is a remarkable evidence of the vitality of our industry. Where camps or munition works are included in the district, the result is a substantial increase in consumption. As examples, I may mention Brentford (4½% increase), Exeter (4½%), Newcastle (7½%), Newport (4%), Redhill (18%), Reading (6%), Wellingborough (4½), Weston-super-mare (7½%), Weymouth (4½%). As a rule the decreases experienced by those who do not enjoy the advantages of military neighbors or government factories, are slight, though in some particular instances a falling off of as much as 25% is reported. This, as already remarked, is entirely of a temporary character. Sales of coke and sulphate of ammonia are fairly active, but tar is at a very low figure, and the stocks carried by gas undertakings are high. It is evident that the existing distilling plants are unable to keep pace with the productions, and that other outlets for tar are needed.

The necessity for a pure and unpolluted atmosphere, as a matter affecting public health, is so obvious that no one is likely to quarrel with the appointment of an influential committee, including the best meteorological, hygienic and chemical talent in the country, but an individual so disposed could not fail to be converted by the perusal of the first report on "Atmospheric Pollution," which appears as a supplement in a recent number of the "Lancet." That the work done by the committee is in no sense scamped, is proved by the fact that the document extends to 40 pages, and includes 18 maps of the districts where observations have been made. Commencing with a specification of the constituents proper to normal air, the authors proceed to observe that anything tending to disturb such constitution, either by way of addition or of absorbtion, is "pollution." The point of special interest to us, in connection with this subject, is the important share taken by soot and other products of incomplete combustion, in such disturbance, and which is a source of so much trouble in the manufacturing towns. An analysis of the matter intercepted by the ventilation filters at a London institution, showed that it consisted of about equal parts of sand and road debris such as might be raised by wind, and of products of combustion, which include carbon, tarry matter, ammonia, sulphate, etc. The tar attaches itself to the carbon particles and gives them great adhesive powers, so that when once deposited on building stone, brick, etc., they are not readily detached and washed away by rain, as would be the case with a dry powder; and it is well known that alkaline sulphates have a pernicious effect on building material. The average atmosphere may be expected to deposit in any one winter month, no less than 15 tons of solid matter per kilometre of surface, which would include 3 tons of carbon and tar, 6 tons of insoluble inorganic silicious dust, 3 tons of sulphuric acid, 1 ton of chlorine, and one-third of a ton of ammonia. Soot from an ordinary household chimney was found to contain 6% of sulphate acid, 8% of chlorine, 24% of tar, and 4% of ammonia; and the smoke issuing from the same, in addition to being charged with such matters, contained sulphuretted hydrogen and carbon monoxide. Restrictions on the combustion of raw coal are being recommended for economical reasons, and it is evident that such are also desirable from a hygienic point of view.

The committee gave a fair and accurate statement of the work done by the gas industry in connection with the prevention of atmospheric contamination, by the displacement of many thousands of coal fires with gas cooking and heating appliances, and state that the products of combustion from an atmospheric gas burner consists mainly of carbonic acid and water vapor, together with a minute quantity of sulphur oxides. There is a total absence of those tarry and carbonaceous substances that are produced by the use of raw coal, and the sulphur is so exceedingly small in amount that the gaseous method of heating is comparatively innocuous. A coal fire using 21 pounds of coal per day, would be equivalent to a gas fire consuming 200 cubic feet of gas in the same time, and whereas the coal would evolve about 1,500 grains of sulphur in various forms, in addition to the objectionable impurities above enumerated, the gas would contribute only 50 to 60 grains of sulphur in the form of sulphur oxides. We may remark that the estimate of 25 to 30 grains of sulphur per 100 cubic feet of gas is probably somewhat above the mark, as many gas undertakings average less than 20.

As the lighter derivatives from coal tar are attracting much attention at present, and the question of whether benzene and toluene, when present in town gas, are to be regarded as matter in the right place, is under serious discussion, I may refer to an interesting article communicating the current number of the "Journal of the Society of Chemical Industry," by Mr. Hugh W. James, A. R. C. SC. (London), describing the methods used for the determination of benzene, toluene and xylene in tar, naphtha, etc., as likely to be useful to the gas works chemist who is called upon to supply definite information in connection with these matters. The information given is also helpful as applied to the working of tar dehydration apparatus, or of special extraction processes. Not the least important part of the paper is an illustrated description of an iron tar still for laboratory use, that can readily be made up in any gas works that runs a blacksmith's shop. The present condition of the tar market in this country, together with experiments for getting rid of pitch by way of the retort house that are now in active progress, go to show the desirability that gas works of any important magnitude should be equipped with the necessary appliances for distilling tar to any required degree up to the production of pitch in the still. Hitherto the gas engineer has had no inducement to concern himself with the quality or composition of the contents of the tar well, but there is now a probability that he will be called upon to alter this condition of things, and if hydrocarbons of the benzene series are to go into this receptacle in future, and not into the gasholders, the process of condensation should be modified, and caused to secure the desired result.

Bunsen Burner Design and Operation.

From paper by G. C. CARNAHAN, to the Illinois Gas Association.

The first heating done with gas was probably by means of luminous flames, that is, a flame in which no primary air was used. After the invention of the Bunsen burner, about 1855, both the luminous and non-luminous flames were used for heating, but the Bunsen burner has become more and more common, until now it is practically the only one used in gas appliances for domestic use, where the heating value of gas is important. Therefore, this paper is confined to a discussion of the non-luminous flame and the Bunsen burner.

KINDS OF ORIFICES.

The first consideration is the proper regulation of its gas supply. This means that the quantity of gas delivered should be approximately what the burner can properly handle, and the way it enters the mixing chamber should be such that it will produce enough siphonic action to entrain the proper quantity of primary air to produce a Bunsen flame.

In general practice, the control of gas consumption is by means of a gas cock or valve, in conjunction with a spud cap with a drilled orifice; the orifice controls the quantity of gas delivered to the burner when the gas cock is open.

Orifices may be grouped into two general classes, "Fixed" and "Adjustable." The former is simply a drilled hole of such diameter that its area will permit a fixed flow of gas at a given pressure. This type of orifice is generally used when the demand is practically constant, and the gas delivered at fairly constant pressure and quality.

The "Adjustable" orifice is a fixed orifice of such size that it will deliver the maximum gas at the lowest probable pressure, in conjunction with a pin or needle adjustment, movable to or from the orifice in such a way that the effective area of the opening can be reduced. The adjustable orifice is commanly used to take care of the variation in gas quality and pressure. Generally the adjustment is by moving the needle, although there are types that have a stationary needle with a movable spud cap.

There are other types of adjustable orifices, but they are not as commonly used as the two mentioned.

ORIFICE CONSTRUCTION.

The object of an orifice is to secure the proper quantity of gas for the burner. When the condition of gas pressure and quality are fairly constant, the fixed orifice is, without doubt, first choice; but, when variable conditions must be taken into consideration, an adjustable orifice is very useful.

The second consideration in selection and placing an orifice is to effectively use the mechanical energy of the gas to produce a good mixture of primary air and gas, so that a sharp Bunsen flame will result.

The mechanical energy available from gas pressure is comparatively small, and must, therefore, be used to the best advantage. In burners for domestic appliances, it is necessary to secure a mixture of gas and primary air containing about half of the air necessary for complete combustion of the gas.

The primary air is drawn through the air ports and made to mix with the gas by a reduction of the pressure beyond the ports caused by the siphonic action of the jet of gas flowing from the orifice at high velocity. The resulting mixture is carried up the mixing tube and out at the head of the burner. The velocity with which the mixture travels from the burner head must be sufficient to keep the flames from traveling back through the burner and igniting the gas at the orifice. This is generally prevented by the burner head acting as a screen and cooling the mixture below the ignition temperature. It is desirable, however, to utilize as much as possible of the mechanical energy of the gas in forcing the gas air mixture from the burner head, and any mechanical obstructions or sharp bends in the tube reduces this energy and are very undesirable.

To effectively use the mechanical energy available from the gas pressure, it is necessary that no great amount be wasted by inadequate size supply or reductions in pressure before the gas reaches the orifice. In some cases appliances have been found in which, with a service pressure of 5", the effective pressure behind the orifice was only about 1". This means that the resulting stream of gas will have a low velocity and a sluggish flame will be produced. Valves are probably responsible for the excessive loss of pressure in most cases, especially those controlled automatically, as the travel of the valve stem is small.

To illustrate the effect on the primary air, taken in when the effective gas pressure is reduced, the following case is taken. A burner consuming 26 cubic feet of gas per hour, supplied through a fixed orifice at 4" pressure, was found to use 51 cubic feet of primary air, giving a mixture approximately two parts air to one of gas. By increasing the diameter of the orifice and decreasing the gas pressure so that the burner again consumed 26 cubic feet per hour, it was found that 39 cubic feet of primary air was used per hour. This gave a mixture of 1.5 parts air to 1 gas, which, with carburetted water gas of 22 candle power, burns with a partially luminous flame. This shows that to obtain an increase in the percentage of primary air in the mixture, thus making the resulting flame harder, it is only necessary to increase the velocity of the gas flow through the orifice. However, the same result may be obtained by increasing the size of the air port, if the burner does not flash back. Other conditions being equal, the greater the velocity of the gas leaving the orifice, the greater will be the siphonic action, which means an increase in the primary air entrained with the gas. Another point to be considered, is proper alignment of the spud to secure right direction of gas flow in the mixing tube. When the jet of gas is not directly in the center of the mixing tube, very much less air is drawn in at the air ports.

Other things that reduce the mechanical energy of the gas, are poorly reamed orifices and adjustment pins off center, the latter a common fault. The most noticeable result of this is an effective area shaped like a new moon, which directs the flow of gas toward the side of the mixing tube.

Most domestic appliances are built for uniform condition of gas quality and pressure, and some manufacturers have fixed gas orifices which give the proper results for one certain set of conditions. These "Standard" orifices are furnished wherever the appliance is installed, even if not suitable for local pressure or quality of gas. Consequently, many appliances made for low gas pressure when installed where there is higher pressure pass a great deal too much gas.

To adjust burners for variable pressure and quality, there are two schemes that can be followed. The first is to change the spud

caps in the case of "fixed" orifices, or by some form of the "adjustable" orifice. This method can be used, except for small variation, only when the primary air ports are adjustable. When the pressure change is from low to high pressure a preliminary orifice may be inserted in the gas line, causing a reduction so that the effective pressure is about that for which the burner was designed. This scheme has been applied to automatic water heaters in Chicago with good results.

Adjustments on domestic appliances should be made by a competent gas man. It is not unusual to find water heaters burning from 50 to 100% more gas than they should, simply because a novice has been trusted to adjust the heater, or has tampered with the gas control after proper adjustment was made.

Calculating the size orifice to deliver a certain amount of gas is comparatively simple when the gas pressure and density are known.

The formula for flow of gas through a small orifice is:

$$Q = 3.7\ D^2 \sqrt{\frac{H\ (460 + t)}{r.\ B.}}$$

Q—Being the Quantity of gas in cubic feet per minute.
D—Diameter of orifice in inches.
H—Pressure of gas or drop in inches of water.
t—Temperature of gas in degrees Fahrenheit.
r—Density of gas referred to air.
B—Barometric pressure (Abs.) in inches of mercury.

The other factors vary but little and may be taken for average conditions. Even though the intention is to use an adjustable orifice it is good practice to figure the maximum opening for the gas consumption permissable, and thus all adjustments will result in consumptions equal to or less than this. When the appliance is installed and in the hands of the customer, tampering with it is easy. The most undesirable results are obtained from adjustments resulting in an over-supply of gas to a burner. In most cases this means a high percentage of carbon monoxide in the combustion products, which may find its way into the room because of a choked flue or disconnected flue pipe. This conditions may lead to fatal results, and for this, as well as economic reasons, should be guarded against. It is manifest to those experienced in the gas appliance business, that no guess work should be used in regulating the gas consumption of burners.

Primary Air Ports.

Probably the two factors having the most bearing on the design of burners, are quality and pressure of gas. The foregoing paragraphs have indirectly discussed the relation of gas pressure to design of primary air ports. It was pointed out that gas delivered at high pressure will draw in more primary air than the same amount of gas delivered at a lower pressure. The following curves will make this point clearer.

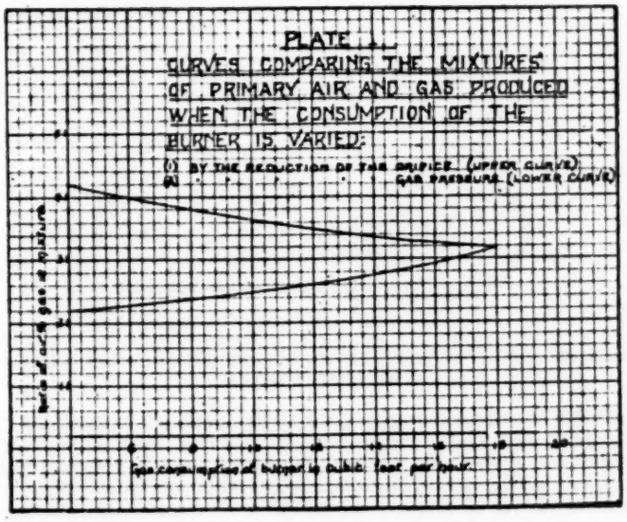


PLATE
CURVES COMPARING THE MIXTURES OF PRIMARY AIR AND GAS PRODUCED WHEN THE CONSUMPTION OF THE BURNER IS VARIED:
(1) BY THE REDUCTION OF THE ORIFICE (UPPER CURVE)
(2) GAS PRESSURE (LOWER CURVE)

The curves in Plate 1 show the results of experiments with a top burner of an ordinary gas range. The upper curve shows the mixture of primary air and gas obtained when the gas pressure was constant and the flow of gas reduced by decreasing the size of the orifice. The lower curve was obtained by reducing the gas flow by turning the gas cock until each desired gas rate was obtained. This reduced the effective gas pressure at the orifice, the area of the orifice remaining constant. Therefore, assuming that a certain mixture of primary air and gas burns properly with a given burner, it is evident that for a given quantity of gas you must have smaller air ports for gas delivered at a high pressure than when under low pressure.

Conditions being so different in various cities, some steps had to be taken to meet the variation, and adjustable air ports came into use, and are now found on almost every gas range, and many other appliances not specially designed for a particular locality.

The primary air desirable, in other words the kind of flame best suited for the work, must also be considered. In certain appliances short hard flames are best, while in others they are not essential. The air necessary for the complete combustion of the three common commercial gases, carburetted water, coal and natural gas, has been calculated from average analyses of these gases, and it has been found that 1 volume of carburetted water gas of 22 candle power requires about 5.9 volumes of air for complete combustion; coal gas of 16-candle power requires about 5.8 volumes, and an average natural gas requires about 9.0 volumes. Another point that must be considered is the limits between which the gas and air mixture is combustible. The following shows the range of combustible mixtures for three gases:

Combustible Mixtures of Gas and Air.

	Low Limit		Perfect Mixture		High Limit	
	Per ct gas	Ratio of air to gas	Per ct. gas	Ratio of air to gas	Per c. gas	Ratio of air to gas
Carburetted... Water Gas.... 24 C. R.....	7	13.9 to 1	14.6	5.9 to 1	23	3.3 to 1
Coal Gas..... 16 C. P..... Benzol..... enriched.....	8	12.5 to 1	14.8	5.8 to 1	23	3.3 to 1
Natural Gas...	6	16.6 to 1	10.0	10.0 to 1	13	7.7 to 1

From these figures it can be understood why the action of natural gas is so different in a given burner from coal or carburetted water gas. In the first place it requires more air for complete combustion, and it is a slower burning gas, that is, it does not combine as rapidly with the oxygen of the air. Probably the reason for this is that natural gas is composed chiefly of methane, which is a saturated hydrocarbon and requires heat to break it up into hydrogen and carbon, before these can unite with oxygen. This breaking-up process is an endothermic reaction, that is, one requiring heat, and consequently some of the heat of the flame is absorbed in the breaking-up. The result is that the flame tends to elongate, and especially to lengthen the inner cone, which is the surface over which this preliminary action takes place. In this respect coal gas is somewhat slower burning than carbureted water gas and has a tendency to a longer inner cone, as the former gas generally contains between 35 to 40% methane, carburented water gas containing only from 17 to 22%. The effect of these factors on back-firing may be seen by reference to Plate 3. Even though carburetted water gas is higher candle power than coal gas, the latter becomes luminous much sooner when the percentage of primary air is reduced; the reason being that the inner cone of the coal gas flame elongates, and when it extends almost the entire length of the flame the carbon given up by the decomposition of methane is well at the top of the flame, and is heated to incandescence in the presence of only a small amount of oxygen.

It is, therefore, to be concluded that coal gas and carburreted water gas require about the same primary air, and natural gas very much more. Coal gas draws in a proportionately greater amount of primary air through a given air port than either natural or carburreted water gas, because of its higher velocity at a given pressure. Accordingly, air ports suitable for a certain consumption of carburetted water gas would have to be reduced if the same amount of coal gas is to be used, and increased greatly for natural gas. However, in the case of the latter, the general practice is to reduce the gas to a suitable amount for the existing air ports. This is a reasonable method as the heat value of natural gas is higher, thereby making the net heating effect nearly the same.

There seems to be no difficulty in establishing the proper size of

primary openings in a burner for pressure conditions and quality of gas not usually varied, but it seems that few manufacturers of domestic gas appliances have a clear conception of what to expect when they introduce their product in territory where either or both quality and pressure are different from conditions for which the burners were designed. Where higher gas pressure exists, there have been some deplorable results obtained with water heaters built for low pressure, due to the fact that the appliance was not adjusted or equipped to take advantage of high gas pressure.

Summing up the conditions that affect size of air ports, it may be said that for a fixed consumption the higher the pressure under which the gas is delivered the smaller the air ports necessary. Other conditions being constant, coal gas requires the smallest air ports, carburetted water gas a trifle larger opening, and for natural gas the ports must be much large.

Burner-Head Design.

The design of burner heads is of equal importance, if not more than either orifices or air ports. Here the important consideration is the manner in which it is desired to distribute the heat. The two extremes may be illustrated by the ordinary Bunsen with but one opening delivering the flame in one upright jet, and the ordinary gas oven burner with perhaps 40 or 50 small jets delivering the heat over a comparatively large area. In this latter type much is yet to be learned of the proper ratio of total burner opening to air ports and the maximum gas consumption. It is almost impossible to make any mathematical statement of this as there are so many factors. However, it is known that a larger aggregate area of burner head openings can be used without danger of backfire when the area is distributed among a large number of small holes. This is probably due largely to the increase of friction loss with the increase of the number of holes, and the increased cooling effect of the burner head. As the friction increases the pressure drop over the burner head will be greater and this also means that the jet of gas entering the mixing chamber will draw in less air. The effects on the gas-air mixture are similar to those produced by the reduction of the area of openings in the burner head, and are shown on Plate 2.

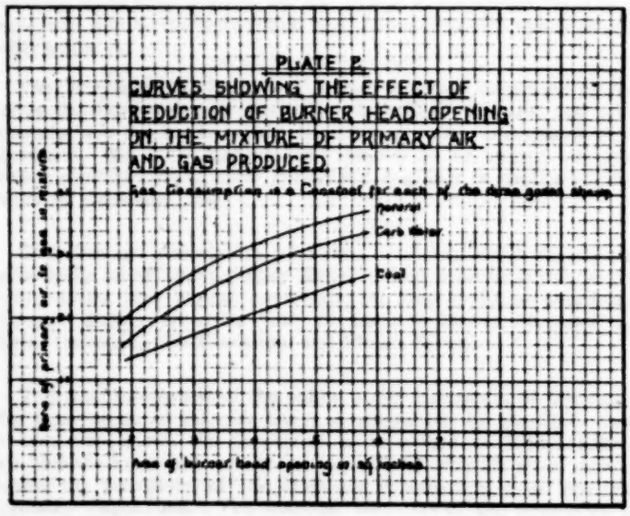


PLATE 2.
CURVES SHOWING THE EFFECT OF REDUCTION OF BURNER HEAD OPENING ON THE MIXTURE OF PRIMARY AIR AND GAS PRODUCED.
Coal

These curves were obtained with one Bunsen burner, the same adjustment of air ports, and the same gas pressure; the variations produced by reducing the size of the burner head opening.

The quantity of gas flowing from a burner head has a similar effect, in that, up to a certain limit, the more gas delivered at a constant velocity, the lower will be the percentage of air in the mixture produced. This is because an increase in the quantity of mixture to be forced through the burner-head per unit of time, means greater drop in pressure over the burner-head. This, of course, necessitates a building up of pressure, as is the case with the reduction of the area of openings, with the result that with more pressure in the burner head, the less will be the injective action of the gas jet and less air will be drawn in. The curves on Plate 3 show the effect of increased gas consumption on the resulting air and gas mixtures.

Maintenance.

When the proper area of burner head opening has been established the next consideration in design is maintenance. When a burner head is a solid casting and not subjected to unusual conditions, this feature is of little importance. However, if burners are used with pilot lights and subjected to severe conditions, as in automatic water heaters, maintenance becomes important. On this type of burner it is necessary to use a flame check or gauze behind the main burner head openings to prevent "flash backs." The flame checks, by reason of their small openings, soon become filled with dust, carried in with the primary air. Consequently, it is necessary to periodically clean them, and a plain flat gauze is perhaps the best device from a maintenance standpoint.

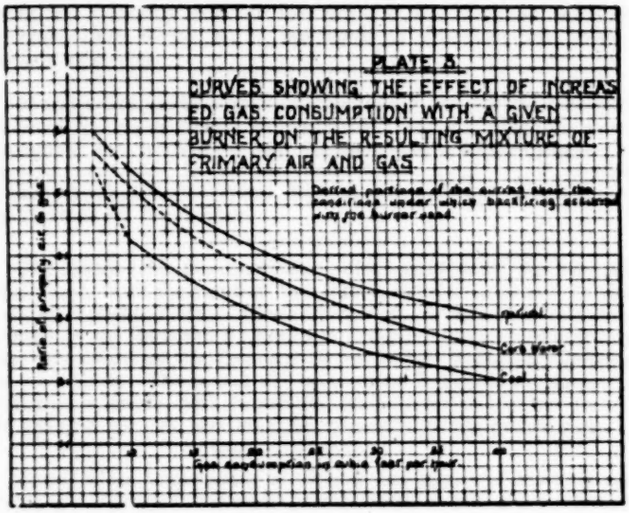


PLATE 3.
CURVES SHOWING THE EFFECT OF INCREASED GAS CONSUMPTION WITH A GIVEN BURNER ON THE RESULTING MIXTURE OF PRIMARY AIR AND GAS.
Coal

Another important consideration, especially for automatic water heaters, is to keep the flame from heating the burner, and to have the burner so constructed that the water of condensation cannot drip into the burner head.

Effects of Operating Conditions.

When it is desirable to spread the heat over a large surface, as is the case of an oven burner, the openings should be close enough together to permit easy ignition between jets. It has been found desirable to join the rows by drilling holes between and at the end of the rows.

Increasing the thickness of the metal near the openings decreases flashing back. This applies to the top burners on a gas stove as well as to pipe burners.

On both tank and automatic water heaters, proper operation of the burner depends as much on surrounding conditions as on burner design. Perhaps the most important consideration, outside the burner, is the draft. Its most noticeable effect is backfiring, or extinguishing the flames by sudden pull of air through the mixing tube, which results in a very thin gas-air mixture. This has been remedied by putting on draft hoods and increasing the thickness of metal in the burner heads. When bad flue conditions prevail, burners often back fire by the flames floating down to the air ports and igniting the gas there.

It has been said that 80% of all automatic water heater trouble was burner trouble, and that 80% of burner trouble is due to condensation. There are two general methods used to keep the condensation away from the burners. One consists in the use of plates in the coils, to deflect the condensation into a gutter or ring; the other system consists in using an offset heater shell, and placing the burners underneath the offset. This is good for small heaters, but hardly applicable to the larger sizes.

In conclusion, the work outlined in this paper is necessarily fundamental, and is presented primarily to arouse consideration of work that must be well done in order to render satisfactory service to consumers of gas.

Commission Law Not Retroactive.—Holding that the language of the act creating the New Jersey commission is not retroactive, the Court of Errors and Appeals has rendered a decision that will restore to Plainfield its free lighting contract with the Public Service Electric Company. The city had a contract by which its council chamber and other buildings were to be lighted free of charge. This was carried out for 15 years, and then the company discontinued doing so because the public utility act made it unjust to give a preferential rate to any person, corporation or locality.

The Newly Elected President of the Wisconsin Gas Association.

MR. F. L. CROSS.

General Manager, Madison Gas and Electric Co.,

Madison, Wis.

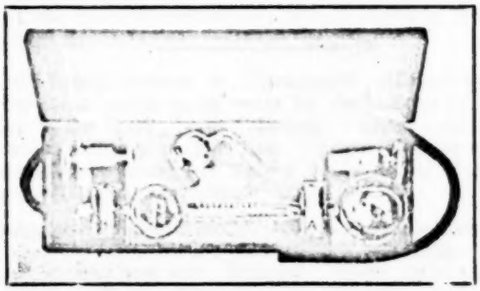
Epoch Making Inventions by Americans.

That most of the epoch making inventions of the last 40 years have been made by Americans, is shown by this list from the annual report of the Secretary of the Interior:

Telephone	Bell	1876
Typewriter	Sholes	1878
Cash register	Patterson	1885
Incandescent lamp	Edison	1880
Talking machine	Edison	1878
Electric furnace reduction	Cowles	1885
Electrolytic alkali production	Castner	1890
Transparent photograph film	Eastman	1888
Motion-picture machine	Edison	1893
Carborundum	Acheson	1891
Calcium carbide	Willson	1888
Artificial graphite	Acheson	1896
Split-phase induction motor	Tesla	1887
Air brake	Westinghouse	1869
Electric welding	Thomson	1889
Type-bar casting	Mergenthaler	1885
Chain-stitch shoesewing machine	French & Myers	1881
Single-type composing machine	Lanston	1887
Chrome tanning	Schulz	1884
Disk plows (modern type)	Hardy	1896
Welt machine	Goodyear	1871
Electric lamp	Brush	1879
Recording adding machine	Burroughs	1888
Celluloid	Hyatt	1870
Automatic knot-tying harvester machine	Appleby	1880
Water gas	Lowe	1875
Machine for making barbed wire	Glidden	1875
Rotary converter	Bradley	1887
Automatic car coupler	Janney	1873
High-speed steel	Taylor & White	1901
Dry-air process for blast furnace	Gayley	1891
Block signals for railways	Robinson	1872
Trolley car	Van Depoele	1874
Harveyized armor plate	Harvey	1891

New Methods and Appliances.

POCKET-SIZE CARBON DIOXIDE INDICATOR.—As a substitute for the standard type indicator for determining carbon dioxide in furnace and flue gases, this pocket instrument has been designed, which by reason of its size can be conveniently carried around, and is simple and quick in operation.



A Pocket Instrument for Determining the Amount of Carbon Dioxide in Flue and Furnace Gases.

The bulb at the right, which is the lower one when the indicator is in use, is filled with a solution of caustic potash, one filling being enough for about 200 determinations. To make a determination the end of the rubber tube is inserted in the wall of the flue, the cock, *B*, opened and sample of gas pumped in by compressing and expanding the rubber bulb. As soon as sufficient gas has been drawn in, the cock, *B*, is closed, and the lower one, *A*, opened to permit the gas to come in contact with the solution of caustic potash. After the gas and solution have been thoroughly mixed the cock is closed, and the apparatus inverted and immersed in water. The cock, *B*, is then opened, and water flows in to take the place of the carbon dioxide absorbed by the potash. The valve is then closed and the apparatus placed in normal upright position, the height of the water in the graduated tube between the two bulbs indicating the percentage of carbon dioxide. Opening *B* and pouring out the water completes the operation, which has taken approximately 2½ minutes, and the apparatus is ready for another determination.

WELDING FLANGES OF STEAM PIPES.—At the recent annual meeting of the American Society of Mechanical Engineers in New York, considerable discussion was devoted to methods of installing high-pressure steam-piping systems of large central stations. The piping system must be capable of handling large quantities of steam at high pressure and high degree of superheat efficiently, safely and reliably; and must be capable of remaining in service for long periods without attention or inspection.

Reference was made to the practice of fusing together the lap flanges of pipes to avoid gaskets troubles and steam leakage. The Commonwealth Edison of Chicago, is now doing this at its Fisk Street station. The station contains ten 10,000-kw. vertical type, one 25,000-kw. and one 20,000-kw. horizontal type turbo-generator; and on the latter installation fused flanges are used between the steam header and the turbine. Instead of using gaskets between the flanges, they are drawn up face to face and bolted rigidly and the edges fused together. The thickness of the weld is small, since the intenion is not to increase the mechanical strength of the joint, but to eliminate gaskets, and in this way prevent leakage of steam.

The welding of flanges in this manner increases safety and reduces possible operation troubles. In large plants oxy-acetylene outfits for welding and cutting are usually available, hence there is little difficulty in making and unmaking the joints when occasion arises.

Items of Interest from Various Localities.

ANOTHER instance of Denver's share in America's campaign for the world's trade, and a testimonial to the far-reaching influence of Colorado-made products, has just come to light in a letter received by the Denver Gas and Electric Light Company, operated by Henry L. Doherty & Company, from D. Zacharias & Company, of Athens, Greece. The letter contained a check payable to the Company, accompanied by an order for crude napthalene, which the Greek firm desires shipped to Athens. This is the first shipment that the Crown Tar Works has made to a foreign country. As this product is refined and used in the manufacture of shells, the consignment is probably ordered with a view to testing its efficacy for this purpose.

PHILADELPHIA Section Gas Meeters had their most successful dinner dance on the Roof Garden of the Bingham Hotel on the evening of March 17th. Of course, in honor of good St. Patrick, green predominated in decorations, literature and food. There were 83 present and a merrier party would have been hard to find. The foyer on the roof was transformed into a reception room, and there old acquaintances were renewed and new ones made. The Alpha orchestra furnished music throughout the dinner, and many a light fantastic trripped its way through the mazes of one-step, two-step, three-step and fox-trot. The menu was all that could be desired. Every one present was decked in appropriate caps and green balloons were passed from table to table, which greatly enlivened the party. After the dinner was over the tables were pushed back and all joined in a hands-around Paul Jones. By 11:30 most having regretfully departed, a few gathered around and sang some good old songs. The final dance to "Home, Sweet Home" marked the passing of one of the most enjoyable parties ever held by the Meeters.

THE Public Lighting Committee, of the Massachusetts Legislature, has reported on a bill advocated by Hyde Park extending the Boston 80 cent. rate to that suburb of the Hub, recommending that the matter be referred to the next General Court. The gas now used by Hyde Park is made by the Boston Consolidated Gas Company and sold to the Hyde Park and Dedham Gas Company which distributes it.

THE Maryland Clay Products Company has been organized to develop the clay properties of the Maryland Coal Company, and will manufacture fire brick, hollow tile, fire proofing, and glazed clay products. Mr. L. N. Ranche, well known as an expert on gas bench construction, is chief consulting engineer in charge of the work at Lonacoing, Md.

THE Missouri Association of Public Utilities, which represents practically all of the privately owned public utilities in the State, will hold its 10th annual convention on May 11-13, on board the Steamer Quincy, en route from St. Louis to Peoria, Ills., and return, traversing the Mississippi and Illinois Rivers.

THE final assessment of the public utility companies of Michigan for taxes on an ad valorem basis, as announced by the State Tax Commission, shows the properties to be valued at $253,041,200. On this the State will collect in taxes $5,165,867.32, all of which, under the provisions of the Michigan constitution, goes into the primary school fund. The assessed valuation of the properties is $3,755,300 over last year's total.

THE Carbondale (Pa.) Gas Company has had to change to larger quarters on account of the steady increase of business. An increase of 60% has been shown in the past two years, and from present indications this percentage of increase will be maintained for some time to come. The increase is largely due to the company's excellent organization under Superintendent A. B. Scheer. The new office quarters are at 15 17 N. Main street.

LEONA E. (Foster), widow of ex-Mayor Alfred M. Norton, died March 24th, at her home in Nashua, N. H., following a long illness. Death came quietly and peacefully at the end of a long life of noble womanhood. Mrs. Norton was born in Norway, Me., Aug. 13, 1831; and married to Mr. Norton July 13, 1859. They moved to Nashua from East Boston, Mass., in 1874. She was a communicant of the Church of the Good Shepherd since its foundation, and took deep interest in all its activities. She was the mother of eight children: Mary E. and Mrs. Albert J. McKean of Nashua; Harry A. of Winchester; Leona N. Ivers and Fred W. (both deceased); Paul T. of Nashua, Arthur E. of Arlington and Walter F. Norton of Nashua. Ten grandchildren and a sister, Mrs. Chas. S. Whitehouse of Rochester, N. H., also survive.

AT the annual meeting of the stockholders of the Brooklyn Borough Gas Company, held at the office of the company, on Surf avenue, Coney Island, N. Y., the board of Directors was unanimously re-elected.

APPLICATION has been made at Harrisburg, Pa., for the incorporation of the Bucks County Southern Gas Company, which purposes to supply gas to Warminister, Northampton and Southampton, a district untouched by corporations of this kind. W. F. Harold Braun, Howard S. Baker and Mary A. Chennall are named in the application for the charter.

THE contract for the construction of a tunnel under the Hackensack river, from the plant of the Public Service Company, at the foot of Duffield avenue, Jersey City, N. J., to lands recently purchased by the Seaboard By-Products Company, has been awarded by the Public Service Gas Company to the Arthur McMullen Company of New York. The tunnel will be circular, 7 feet inside diameter, 645 feet in length, with two shafts, built 64 feet below low water. It will cost $62,500 and must be completed by December next.

THE Utilities Commission of Illinois has approved the new gas rates for Morrison, effective March 20th, to all gas consumed through straight meters. The new rates are as follows:

$1.35 per 1,000 cubic feet for the first 2,000 cubic feet consumed per month.
$1.30 per 1,000 cubic feet for the next 1,000.
$1.20 per 1,000 cubic feet for the next 1,000.
$1.10 per 1,000 cubic feet for the next 1,000.
$1.00 per 1,000 cubic feet for the next 5,000.
90 cents per 1,000 cubic feet for the next 15,000.
80 cents per 1,000 cubic feet for the next 25,000.
70 cents per 1,000 cubic feet for the next 25,000.
60 cents for all over 75,000 cubic feet consumed per month.

The rates are subject to a discount of 10 cents per 1,000 if paid within 10 days.

THE Grand Rapids (Mich.) Gas Light Company on March 20th, distributed $5,000 to 250 employees as their regular quarterly share of the earnings.

FOR the Pure Food Exposition in Racine, Wis., the Wisconsin Gas and Electric Company piped the hall and provided 25 hot plates and ranges for exhibitors, besides several big gas baking ovens for the Linther Baking Company.

AT the last meeting of the employees' association of the Rockford (Ills.) Gas Light & Coke Company, Ray Doherty was elected chairman, John Gilmore, vice chairman, and Frank C. Shugart, secretary and treasurer. The trustees are L. E. Stocking, Halley Russell, Arthur Lornquist, George R. Farmer, E. Fidele, John E. Wolfe and Charles Monks. The association has been organized for sometime and intends to promote goodfellowship between the employees and the company.

A CLASS of over 30 of the employees of the New Haven Gas Light Company celebrated their graduation after a year's study of a course on "Science of Business Efficiency." The meeting was opened by Phillmer Eves, president of the class, who announced that, of 34 students enrolled a year ago, 32 had earned diplomas. J. Arnold Norcross, treasurer of the company, then took the chair and gave a forceful address on the proper training of the will and the scientific development of the true desire to serve. Interesting educational addresses were given by F. R. Benjamin and Albert C. Dieffenbach, of Hartford. The diplomas were presented by Mr. Benjamin, and Mr. Norcross handed each of the graduates a check, refunding half of the cost of the course. This generosity of

the company was thoroughly appreciated by the graduates, and expressed in a formal resolution.

THE Omaha (Neb.) Gas Company has just finished remodeling its office and display rooms, and now has spacious well arranged quarters. The bookkeepers have been moved to the ground floor, where they are more accessible. A line of gas ranges and water heaters has been placed on display, and the basement has been fitted to accommodate an exhibit of hotel and industrial appliances.

PLANS are being perfected by the Pacific Gas and Electric Company for a pension system for its employees. The company has from time to time placed some of its oldest employees on a pension, and now it is proposed to put into effect a system under which all employees will be entitled to a pension after a certain length of service. General Manager John A. Britton has not completed the details of the plan, but he has applied to the State Railroad Commission to make provision for such a system, with the attendant expense.

MR. E. E. EYSENBACH, recently of San Antonio, Tex., has been chosen manager of the Hartford (Conn.) City Gas Light Company, to fill the vacancy occasioned by the death of Benjamin W. Perkins. The choice was made by the directors of the company, after considerable search to find a man who would keep the company's plant at the high stage of efficiency attained under the management of Mr. Perkins. Mr. Eysenbach was formerly with the American Light and Traction Company, of New York, and until a short time ago general manager of the company's plant at San Antonio, where he had in charge the gas, the electric and the street railway service.

JOHN F. DOHERTY was the winner of a gas range given by the North Adams (Mass.) Gas Light Company to the one guessing nearest to the total number of parts in the range used in demonstrating. The cooking demonstration, held in the temporary store at 35 Main street, was very successful and, despite the unfavorable weather, was well attended. When the demonstration was concluded the range was presented to Mr. Doherty, who had guessed 574 as the number of parts.

MR. C. W. BENNETT, for the past eight years manager of the Binghamton (N. Y.) Gas Warks, has resigned to become assistant general manager of the Detroit City Gas Company. Mr. Bennett on March 13, celebrated his 23rd anniversary with the American Light and Traction Company, which controls the Binghamton, Detroit and other large gas producing companies.

THE Greeley (Col.) Gas and Fuel Company has applied to the State Public Utilities Commission for a rehearing of its case in which an attempt is made to secure a reduction in freight rates on coal from the southern Colorado coal fields to Greeley. Last August the company complained against the Colorado & Southern, Union Pacific and Denver & Rio Grande railroads, claiming that the freight rate on coal from the Huerfano and Las Animas county coal district was unjustly high; that coal was hauled from Wyoming fields to Greeley, over a much harder route, at a rate less than half as much per mile as was being charged on the southern Colorado coal.

THE organization of a social club of the employes of the Quincy (Ill.) Gas, Electric and Heating Company, was completed with the election of H. O. Channon, President; H. J. Donovan, First Vice-President; J. P. Binkert, Second Vice-President; Milton Breeder, Secretary and William Strauss, Treasurer. A committee was appointed to prepare a tentative constitution and set of by-laws and one to see about suitable club rooms.

EFFECTIVE April 1st, the Goshen (Ind.) Gas Company announces a reduction in rates as follows:

First 5,000 cubic feet—$1.10 gross; $1 net.
Next 5,000 cubic feet—$1 gross; 90 cents net.
Next 10,000 cubic feet—95 cents gross; 85 cents net.
Next 30,000 cubic feet—90 cents gross; 80 cents net.
Over 50,000 cubic feet—85 cents gross; 75 cents net.
The present rate of $1.25 gross and $1 net.

Official approval has been given the schedule by the Indiana Public Service Commission.

THE people of Benton, Ills., are agitating the question of a gas plant.

Utilities Commission News.

NEW YORK GOVERNOR'S NOMINATION OF COMMISSIONERS CONFIRMED.—The Senate of the State of New York, after considerable debate in committee, confirmed the nominations made by Governor Whitman of Travis H. Whitney and Charles S. Hervey to be members of the Public Service Commission for the First District. Mr. Whitney succeeds J. Sergeant Cram, whose term expired on Jan. 31, 1916, and will serve until Jan. 31, 1921. Mr. Hervey will serve for one year, succeeding George V. S. Williams, who resigned in January.

CREDITS LARGE SAVINGS TO COMMISSION.—Pleased with the reduction of local water-meter rates by the Indiana Public Service Commission, the Terre Haute "Tribune" reviews the savings in public utility charges in the State, brought about since the commission came into power. It figures out a saving of $500,000 a year by a net annual expenditure of $73,000.

"Among the amounts directly saved to the consumers, as shown by the records, were these: Indianapolis, gas, $125,000 a year; Indianapolis, light and heat, $233,000; South Bend and Elkhart, light, $45,700; Terre Haute, water, $30,000; Evansville, gas, $25,000; La Fayette, light, $12,000; Richmond, water, $10,000; New Albany, light, $12,000. The most important reductions in all cases have been to small users."

The commission is credited with other savings, not the least of which has been in human lives. The rulings of the commission have been fair to the companies, so that new capital is seeking public utilities investments in Indiana, and the commission has been absolutely non-partisan. No wonder it is popular.

NEW YORK CITY COMMISSION HEARING ON HEATING VALUE.—The First District, New York, Public Service Commission has held its first hearing on the proposal to make the standard of measurement for quality of gas the British thermal unit instead of candle power.

The Second District Commission, which has investigated the subject, favors the plan, and Commissioner William Temple Emmett and James O. Carr, of the Upstate Commission, sat at the hearing.

Commissioner Hayward, after the hearing, said he did not know just who or what is back of the plan to change the scheme for determining quality and power of gas.

"It seems to me, however," he said, "that if the British thermal unit system is adopted the gas companies will save a great deal of money because they will not have to purchase gas oil. If there is to be a saving here the people must benefit from it as well as the gas companies, and I shall insist upon a reduction in the price of gas to the consumer.

"Of course, I am not satisfied that the percentage of persons who use open jets for illuminating purposes is as low as the companies report—that is, 20%. I believe that many more than 20% depend upon the old fashioned burners for light.

"There is no question that measurement by the thermal unit will reduce the candle power and therefore the illuminating power. We will have expert gas engineers and chemists make an investigation before we make any decision, and we will insist that the people benefit from any reduction in cost.

W. F. Hine, chief gas engineer for the Commission, testified that with present day appliances the heating value of gas is more important than candle power, and if mantle lamps were generally substituted for open flame burners it would be desirable to change the standard from candle power to thermal units.

R. Rosensohn, a representative of the Department of Water, Gas and Electricity, said the question of rates should be considered with that of standard, that if the new standard would allow a supply of gas having less heat than that supplied at the present time the difference should be made up to consumers by a reduction in rates.

The hearing was adjourned to Friday, April 7, at 10:30 A. M.

Financial Notes.

DURING the month of February the total business of the PUBLIC SERVICE CORPORATION OF NEW JERSEY showed a gross increase of $410,000 over the corresponding month of last year. For the two months of this year the gross increase is nearly three-quarters of a million dollars. The statement issued by the company follows:

Gross increase in total business	$410,227.32
Percentage of increase	14.5%
Balance available, after payment of operating expenses, fixed charges, sinking fund requirement, etc., for amortization, dividends and surplus	327,557.06
Increase in surplus available for dividends over corresponding month, 1915	66,505.69

Two months ending February 29, 1916.

Gross increase in total business	$737,631.43
Percentage of increase	12.4%
Balance available, after payment of operating expenses, fixed charges, sinking fund requirement, etc., for amortization, dividends and surplus	832,722.43
Increase in surplus available for dividends over corresponding period, 1915	135,754.97

CITIES SERVICE CO. in its report for the year ended December 31, 1915, showed a great improvement in its financial position. In the year bills payable were reduced from $3,393,002 to $15,002, and cash holdings increased from $304,819 to $1,652,640. This was done without increasing the fixed capital charge of the company, the new capital being secured by the sale of preferred and common stocks. In addition, all accrued preferred dividends were satisfied and regular cash payments on the preferred at the 6% rate resumed February 1, 1916. The holders of the common also were compensated by the declaration of 12% in debenture warrants up to July 1, 1916, and regular cash payments at a 6% rate will be resumed on the junior issue August 1. Improvement in the operated companies was made, their unamortised charges being materially reduced, and capital expenditures totalling $2,914,297 made on plants, substantially all of which was funded in the year, the floating debts of the companies showing no appreciable increase. Combined net earnings of the operated properties for 1915 were at a rate of 7% on the $134,606,195 securities of the subsidiary companies and the holding corporation outstanding. Strength in the public utility bond market enabled the subsidiaries to place themselves in good financial position, and a substantial part of the $3,500,000 Denver Gas and Electric Light Co. notes due April 1, 1917, will be retired October 1, 1916, from the proceeds of long time bonds now being sold.

TRUSTEES of the MASSACHUSETTS LIGHTING COMPANIES have declared a dividend of $1.75 per share on the common shares, $1.50 per share on the preferred shares, and 25 cents per share on the new common shares, payable April 15, to shareholders of record March 25. The directors of MASSACHUSETTS GAS COMPANIES declared regular quarterly dividend of $1.25 a share on common stock, payable May 1 to stock of record April 15. Quarterly dividends were declared by the Massachusetts Gas subsidiaries as follows: Boston Consolidated, 2%; East Boston, 2½%; Citizens of Quincy, 1½%; and Newton and Watertown Gas, 2½%, all payable March 31 to stock of record March 29. The net earnings of the subsidiary companies for February were $282,928, or $33,069 larger than those of the corresponding month last year. Following are the earnings, with comparisons:

Gas department.	1916.	1915.	1914.
Boston	$138,888	$146,531	$142,892
Newton	7,931	7,084	5,978
East Boston	6,030	6,582	8,526
Quincy	1,857	2,580	1,378
Totals	$154,706	$162,777	$158,774
Coal department.			
New England Coke	$50,985	$37,936	$53,688
New England Coal	62,737	42,061	87,861
Federal	7,541	7,330	8,652
Boston Tow Boat	6,967	* 236	....
Totals	$128,230	$87,091	$90,201
Grand totals	228,936	249,866	248,975

* Deficit.

THE Massachusetts Board of Gas and Electric Light Commissioners has authorized the ATTLEBORO GAS LIGHT COMPANY to issue additional stock to pay for improvements made and under contemplation. The new stock to the amount of 580 shares is to be sold to present stockholders at $150 a share, although the par value is only $100. Some time ago the company purchased a large tract of land and announced that a new gas works was to be erected upon it. Soon after, however, Taunton men bought into the company and the plans have been changed. The Commission now says that this land "will probably never be utilized for the purpose for which it was bought." In substitution the Commission says the company will expend approximately $90,000 in building a high pressure main to the Norton boundary to connect with the pipe line which the Taunton Gas Light Company is to construct through Norton for the supply of Mansfield, in erecting an additional gas holder on the site of present Attleboro works, the necessary incidental structures and apparatus and some extensions of the distribution system.

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